

ACCESSION #: 9605140093

LICENSEE EVENT REPORT (LER)

FACILITY NAME: TURKEY POINT UNIT 4 PAGE: 1 OF 4

DOCKET NUMBER: 05000251

TITLE: MANUAL REACTOR TRIP DUE TO A TURBINE GOVERNOR CONTROL OIL

PERTURBATION

EVENT DATE: 04/09/96 LER #: 96-001-00 REPORT DATE: 05/06/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 17

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J. A. Hickey, Licensing Engineer TELEPHONE: (305) 246-6668

COMPONENT FAILURE DESCRIPTION:

CAUSE: A SYSTEM: TG COMPONENT: OR MANUFACTURER: W120

X AA LI W120

REPORTABLE NPRDS: Y

Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On April 09, 1996, Florida Power & Light Company's Turkey Point Unit 4 was operating in mode 1 at 17% power. Unit 4 was being returned to service following a successful turbine overspeed test.

At 1759 on April 09, 1996, turbine electric load increased from approximately 90 megawatts electric (MWe) to approximately 237 MWe with no operator action. Steam flow greater than feed flow alarms were received on all three steam generators. Average Reactor Coolant Temperature (Tave) began to lower in response to the increased steam demand. A manual reactor trip was directed. At 1800 the manual reactor trip was executed. The plant responded as expected with the exception that Rod Position Indication (RPI) for control rod N-9 indicated approximately 16 steps immediately following the trip. All Rod Bottom Lights were energized, confirming that all Rod Control Cluster Assemblies had inserted past the 20 step withdrawn position. Subsequent testing confirmed an RPI console meter problem only; all control rods promptly and fully inserted following the reactor trip.

The cause of the reactor trip was prompt manual action on the part of the operating crew in response to degrading plant conditions. The cause of the unexpected electrical load increase was corrosion products interfering with impeller oil flow in the speed sensing portion of the turbine governor.

The governor valve was disassembled and inspected for cleanliness and corrosion products. The impeller oil orifice was cleaned and the governor reassembled.

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I. DESCRIPTION OF THE EVENT

On April 09, 1996, Florida Power & Light Company's Turkey Point Unit 4 was operating in mode 1, being returned to service following a refueling

outage and successful turbine overspeed test.

At 1742, Unit 4 was placed on line with the intention to return to full power. At 1757, with reactor power at 17% and a controlled power ascension in progress, Average Reactor Coolant Temperature (Tave) was observed to drop slightly below the Reactor Coolant System Reference Average Temperature (Tref). The Nuclear Plant Supervisor directed that turbine load be stabilized until Tave could be raised to match Tref.

At 1759, turbine electrical load increased from approximately 90 Megawatts electric (Me) to 237 MWe in 15 seconds with no operator action. Alarms of steam flow greater than feed flow were received on all three steam generators (S/G) [SB:SD]. S/G levels swelled to between 68% and 71%, and Tave began to drop due to the increased steam flow. An attempt was made to manually reduce turbine load; no response was observed. A manual reactor trip was directed due to degrading plant conditions.

At 1800 a manual reactor trip was executed. All systems responded as expected with the exception of Rod Position Indication (RPI)[AA:LI] for control rod N-9, which indicated approximately 16 steps withdrawn immediately following the trip. All Rod Bottom Lights [AA:IL] were energized, confirming that all Rod Control Cluster Assemblies [AA] had inserted past the 20 step withdrawn position. RPI N-9 drifted to zero after several minutes. Subsequent testing confirmed a console meter indication problem for rod N-9 and that all control rods had promptly and fully inserted following the reactor trip.

At 1803 all three Main Steam Isolation Valves (MSIVs) [SB:ISV] were manually closed due to decreasing Tave.

At 1820 Unit 4 was stabilized at no-load conditions, and the Emergency Operating Procedures were exited.

The NRC Operations Center was notified at 1900 on April 09, 1996, in accordance with 10 CFR 50.72 (b) (2) (ii), Reactor Protection System Actuation.

II. CAUSE OF THE EVENT

The immediate cause of the event was prompt manual action on the part of the operating crew in response to degrading plant conditions. A manual reactor trip was executed.

The intermediate cause of the event was erratic turbine governor performance.

The root cause of the event was inadequate foreign material exclusion practices, which resulted in corrosion product interference in the impeller oil orifice which supplies a turbine speed sensing signal to the turbine governor.

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The impeller oil pump [TG:PI] is mounted on the turbine shaft [TA]. The impeller oil pump output pressure is proportional to the turbine shaft speed squared (n^2). The impeller oil pump output pressure is supplied via a restricting orifice [TG:OR] to the turbine governor bellows [TG:BLL]. In this event the restricting orifice became fouled with

corrosion products. The impeller oil pressure downstream of the restricting orifice dropped and the turbine governor sensed a turbine speed decrease. In response to the apparent speed decrease, the turbine governor [TG:65] demanded more steam flow and opened the control valves [TA:FCV]. This resulted in the turbine load increase from approximately 90 MWe to 237 MWe in 15 seconds.

The formation of the corrosion products was the result of inadequate Foreign Material Exclusion (FME). During the recent refueling outage the governor was removed for maintenance. The maintenance area was covered with plastic and tape, however rain water penetrated the disassembled governor. The water intrusion was discovered and all visible areas wiped down. The restricting orifice from the impeller oil supply was not visible, therefore the restricting orifice was not removed, inspected, or cleaned. Upon examination after the event, it was determined that the rain water intrusion caused rust formation inside and around the orifice.

III. ANALYSIS OF THE EVENT

The Updated Final Safety Analysis Report (UFSAR), Section 14.1.8, analysis defines an excessive load increase transient as a rapid increase in steam generator steam flow causing a power mismatch between the reactor core power and the steam generator load demand. The reactor control system is designed to accommodate a 10 percent step load increase and a 5 percent per minute ramp load increase without a reactor trip in the range of 15 to 100 percent full power. Any loading rate in excess of

these values may cause a reactor trip actuated by the protection system.

If the load increase exceeds the capability of the reactor control system, the transient is terminated in sufficient time to prevent DNBR from going below the limit value, since the core is protected by a combination of the nuclear overpower trip and the overpower-overtemperature trips. Possible event initiators discussed in the UFSAR include a malfunction of turbine speed control. In this case, steam demand increased approximately 20 percent in 15 seconds as a result of a turbine speed control malfunction. The excessive load increase event was terminated within 21 seconds of receiving the initial steam flow greater than feed flow alarm by the automatic closing of the turbine stop valves in response to the manual reactor trip. Therefore, this event did not compromise the health or safety of plant personnel or the general public. This event is reportable under the requirements of 10 CFR 50.73 (a)(2)(iv).

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IV. CORRECTIVE ACTIONS

1. The governor valve was disassembled and inspected for cleanliness and corrosion products. Corrosion products were found in the impeller oil orifice that supplies the turbine governor speed signal. The orifice was cleaned and the governor reassembled.
2. The smoothing oil orifice, auto stop oil orifice, governor bellows orifice, and the impeller oil orifice were inspected and verified to

be clean.

3. The load limit control was inspected and verified to be clean.

4. The governor operation was tested with simulated impeller oil pressures to verify correct and stable operation.

5. As a precautionary measure, operations procedures have been revised to maintain the Load Limit at a set pressure above the governor during startup to limit any unexpected control oil pressure excursions. The Load Limit is a turbine load controlling device, which operates independent of turbine speed. The Load Limit operates in parallel with the turbine governor. The device with the lowest demanded control oil pressure setting will control turbine load. Therefore, if an abnormal governor induced control oil pressure increase is experienced, the Load Limit will not allow control oil pressure to rise above the Load Limit demanded value.

6. The RPI console indicator for control rod N-9 was tested and was found to be sticking. However, the exact sticking point of approximately 16 steps could not be reproduced. The RPI console meter was replaced.

7. Control rod drop time testing of the control rod in location N-9 was performed a total of 4 times. The control rod drop times were verified to be acceptable in accordance with Technical Specification

3.1.3.4. The control rod drop time signatures were compared with the post refueling hot rod drop time test performed a few days

earlier. The control rod drop time signatures for the control rod in location N-9 were all comparable and consistent with each other.

Therefore, the control rod in location N-9 continues to be operable.

8. Turbine Controls inspection and overhaul instructions will be revised to include appropriate and complete inspection requirements should an FME failure be detected when the Turbine Controls are opened for maintenance.

V. ADDITIONAL INFORMATION

LERs 251/89-11 and 250/91-08 involved manual reactor trips initiated as a result of turbine control oil problems. However, both events were caused by oil piping failures.

EIIS Codes are shown in the format [EIIS SYSTEM: IEEE component function identifier, second component function identifier (if appropriate)].

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FPL MAY 06 1996

L-96-101

10 CFR 50.73

U.S. Nuclear Regulatory Commission

Attn: Document Control Desk

Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Unit 4

Docket No. 50-251

Reportable Event: 96-001-00

Manual Reactor Trip due to a Turbine Governor Control Oil Perturbation

The attached Licensee Event Report, 251/96-001-00, is being provided in accordance with 10 CFR 50.73(a)(2)(iv).

Should there be any questions, please contact us.

Very truly yours,

R. J. Hovey

Vice President

Turkey Point Plant

JAH

Attachment

cc: S. D. Ebnetter, Regional Administrator, Region II, USNRC

T. P. Johnson, Senior Resident Inspector, USNRC,

Turkey Point Plant

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*** END OF DOCUMENT ***
